Sustainable Water Management

Doctoral Programme (Water4All)

Title of the PhD Project	Investigation of climate change impacts on available water resources using climate model projections and hydrologic models
Acronym	HYDROCLIM-U
Research Fields of the Project	Hydrology and Water Resources, Hydrological Models, Climate Science, Data Science, Uncertainty, Risk assessment
Keywords	Water Resources, hydrological modeling, climate change, uncertainty, risk assessment
Host Institution, Department and Campus Location	Middle East Technical University, Geological Engineering Department, Ankara
PhD Awarding Institution and Graduate Programme	Middle East Technical University, Engineering Faculty/Graduate School of Applied and Natural Sciences
Name and Affiliation of Main Supervisor	Assoc. Dr. Koray K. Yilmaz, Geological Engineering Department, Middle East Technical University
Name and Affiliation of Co-Supervisors	Prof. Dr. Alper Baba, Civil Engineering Department, İzmir Institute of Technology Prof. Dr. İsmail Yücel, Civil Engineering Department, Middle East Technical University
Research Environment and Infrastructure	PhD candidate will have access to the research infrastructure available at Middle East Technical University and Izmir Institute of Technology, including access to high performance computing systems (e.g. ULAKBIM).

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Scientific Context of the Project	Water resources availability and quality will be the main pressures on, and issues for, societies and the environment under climate change. The assessment of climate change impacts on water resources involves several methodological decisions, including choices of global climate models, emission scenarios, downscaling techniques, and hydrologic modeling approaches. Understanding water management risks associated with climate change requires estimating the uncertainty at each of these steps. This project will investigate to which extent the degree of uncertainty due to the choices of climate model, downscaling methods and hydrological model selection contributes to the overall uncertainties in water resources risk assessments under climatic change.
Brief Workplan	The main aim of this thesis is to develop a novel uncertainty framework incorporating and assessing the degree of uncertainties arising from a chain of climate models, downscaling techniques and hydrologic models to better understand water management risks associated with climate change. The tentative workplan is presented below: • Comprehensive literature review and training in climate modeling, downscaling and hydrological modeling topics. Advancing programming capacity. • Identification of study basins, data collection and management, selecting alternative hydrologic model structures, multi-criteria model calibration of hydrologic models using relevant hydrological signatures. • Establish an ensemble of future projections using alternative climate models, downscaling techniques and hydrological models. Analyze projected changes in available water resources including extremes (floods and droughts) • Developing methodologies to reduce the uncertainties and communicate to relevant stakeholders. • Documentation and reporting to compile research findings into a comprehensive report. Prepare presentations for scientific conferences, workshops, and stakeholder meetings. Disseminate results through various channels, including academic publications, stakeholder meetings and public outreach.

Innovative Aspects of the Project	The project aims to improve the characterization and reduction of a series of uncertainties in water resources assessment under climate change. The results of this project will help water resources planning and management community through providing relevant methodologies for incorporating this uncertainty into the decision-making process.
Training Opportunities of the Project	The selected candidate will be offered opportunities for training about hydrological modeling and climate modeling in important operational research centers. The supervisory team and student will discuss and form a training plan at the start of the PhD, considering both personal interests and scientific needs.
Interdisciplinary Aspects	The topic of the project is directly relevant with climate science, data science, hydrology and water resources, policy and governance, hydrologic risk and sustainability studies.
Intersectoral Mobility **☐ Short Visit** **☐ Secondment**	TBD
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International Academic Secondment	TBD

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Main Supervisor	
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Co-supervisors	
Brief CV	**Prof. Dr. Alper BABA** **E-mail:** alperbaba@iyte.edu.tr **Academic Degrees** Ph.D. Hydrogeology, Dokuz Eylül University, Türkiye 2000 M.Sc. Geological Engineering, Dokuz Eylül University, Türkiye 1995 B.Sc. Geological Engineering, Dokuz Eylül University, Türkiye 1992 **Professional Networks** Google Scholar: https://scholar.google.com.tr/citations?user=QVgCMkEAAAAJ&hl=en ResearchGate:

	https://www.researchgate.net/profile/Alper-Baba Scopus: https://www.scopus.com/authid/detail.uri?authorId=7201982375 ORCID: https://orcid.org/0000-0001-5307-3156
Brief CV	**Prof. Dr. İsmail YÜCEL** **E-mail:** iyucel@metu.edu.tr **Academic Degrees** Ph.D. Hydrology, The University of Arizona, USA 2001 M.Sc. Hydrology, The University of Arizona, USA 1996 B.Sc. Meteorological Engineering, İstanbul Technical University, Türkiye 1993 **Professional Networks** Google Scholar: https://scholar.google.com/citations?user=RGHnl3YAAAAJ ResearchGate: https://www.researchgate.net/profile/Ismail-Yucel-2 Scopus: https://www.scopus.com/authid/detail.uri?authorId=57204345432 ORCID: https://orcid.org/0000-0001-9073-9324